1 BLT set 8 over GF(47)

Points on the quadric $x_0^2 + x_1x_2 + x_3x_4$:

$P_1 = (0, 1, 0, 0, 0)$

$P_2 = (0, 0, 1, 0, 0)$

$P_3 = (0, 1, 28, 46, 28)$

$P_4 = (0, 1, 7, 23, 14)$

$P_5 = (0, 1, 42, 35, 27)$

$P_6 = (1, 28, 36, 6, 12)$

$P_7 = (1, 32, 9, 6, 38)$

$P_8 = (1, 18, 2, 23, 27)$

$P_9 = (1, 8, 8, 35, 25)$

$P_{10} = (1, 23, 26, 34, 28)$

$P_{11} = (1, 8, 37, 4, 8)$

$P_{12} = (1, 1, 36, 33, 6)$

$P_{13} = (1, 2, 28, 6, 14)$

$P_{14} = (1, 18, 25, 43, 7)$

$P_{15} = (1, 12, 32, 3, 44)$

$P_{16} = (1, 44, 29, 14, 33)$

$P_{17} = (1, 41, 45, 11, 33)$

$P_{18} = (1, 19, 19, 3, 36)$

$P_{19} = (1, 36, 1, 19, 3)$

$P_{20} = (1, 37, 27, 37, 6)$

$P_{21} = (1, 32, 12, 3, 44)$

$P_{22} = (1, 17, 27, 1, 10)$

$P_{23} = (1, 3, 37, 35, 25)$

$P_{24} = (1, 39, 20, 14, 8)$

$P_{25} = (1, 37, 3, 43, 28)$

$P_{26} = (1, 40, 40, 44, 1)$

$P_{27} = (1, 39, 11, 33, 24)$

$P_{28} = (1, 17, 32, 9, 23)$

$P_{29} = (1, 24, 14, 8, 46)$

$P_{30} = (1, 27, 28, 19, 22)$

$P_{31} = (1, 44, 39, 41, 12)$

$P_{32} = (1, 27, 24, 38, 46)$

$P_{33} = (1, 8, 25, 23, 26)$

$P_{34} = (1, 17, 8, 27, 28)$

$P_{35} = (1, 4, 16, 32, 20)$

$P_{36} = (1, 9, 24, 8, 14)$

$P_{37} = (1, 43, 35, 14, 20)$

$P_{38} = (1, 32, 4, 14, 21)$

$P_{39} = (1, 5, 13, 37, 16)$

$P_{40} = (1, 19, 40, 13, 21)$

$P_{41} = (1, 39, 39, 15, 27)$

$P_{42} = (1, 12, 27, 15, 41)$

$P_{43} = (1, 12, 42, 10, 20)$

$P_{44} = (1, 21, 17, 8, 14)$

$P_{45} = (1, 45, 5, 36, 12)$

$P_{46} = (1, 28, 36, 8, 9)$

$P_{47} = (1, 8, 18, 18, 5)$

$P_{48} = (1, 24, 1, 33, 32)$

Stabilizer of order 24 is generated by:

$$g_1 = \begin{pmatrix} 28 & 30 & 0 & 34 & 6 \\ 0 & 26 & 23 & 21 & 23 \\ 15 & 20 & 26 & 29 & 44 \\ 3 & 44 & 23 & 31 & 8 \\ 17 & 29 & 21 & 15 & 31 \end{pmatrix}$$

$$g_2 = \begin{pmatrix} 26 & 15 & 43 & 18 & 5 \\ 45 & 11 & 43 & 1 & 40 \\ 31 & 39 & 11 & 13 & 16 \\ 26 & 16 & 40 & 0 & 10 \\ 9 & 13 & 1 & 36 & 0 \end{pmatrix}$$

$$g_3 = \begin{pmatrix} 29 & 42 & 23 & 25 & 18 \\ 8 & 17 & 17 & 45 & 12 \\ 37 & 14 & 6 & 7 & 14 \\ 7 & 31 & 40 & 2 & 37 \\ 15 & 16 & 15 & 17 & 39 \end{pmatrix}$$

The induced group has order 24 and is generated by:

g_1 =(1, 3)(2, 34)(4, 31)(5, 42)(6, 11)(7, 27)(8, 32)(9, 14)(10, 33)(12, 24)(13, 35)(15, 20)(16, 21)(17, 22)(18, 45)(19, 28)(23, 26)(25, 46)(29, 30)(36, 43)(37, 44)(38, 41)(39, 48)(40, 47)

g_2 =(1, 8)(2, 29)(3, 47)(4, 42)(5, 27)(6, 37)(7, 31)(9, 15)(10, 38)(11, 26)(12, 13)(14, 43)(16, 18)(17, 30)(19, 24)(20, 36)(21, 39)(22, 34)(23, 44)(25, 33)(28, 35)(32, 40)(41, 46)(45, 48)

g_3 =(1, 9, 10)(2, 11, 21)(3, 4, 38)(5, 8, 14)(6, 35, 29)(7, 15, 33)(12, 39, 34)(13, 48, 37)(16, 19, 26)(17, 45, 44)(18, 28, 30)(20, 47, 31)(22, 24, 23)(25, 27, 32)(36, 40, 46)(41, 43, 42)

group order is small, so we list all elements a_1 =id

a_2 =(1, 3)(2, 34)(4, 31)(5, 42)(6, 11)(7, 27)(8, 32)(9, 14)(10, 33)(12, 24)(13, 35)(15, 20)(16, 21)(17, 22)(18, 45)(19, 28)(23, 26)(25, 46)(29, 30)(36, 43)(37, 44)(38, 41)(39, 48)(40, 47)

a_3 =(1, 8)(2, 29)(3, 47)(4, 42)(5, 27)(6, 37)(7, 31)(9, 15)(10, 38)(11, 26)(12, 13)(14, 43)(16, 18)(17, 30)(19, 24)(20, 36)(21, 39)(22, 34)(23, 44)(25, 33)(28, 35)(32, 40)(41, 46)(45, 48)

a_4 =(1, 47, 32)(2, 22, 30)(3, 8, 40)(4, 7, 5)(6, 26, 44)(9, 43, 20)(10, 25, 41)(11, 37, 23)(12, 19, 35)(13, 28, 24)(14, 15, 36)(16, 39, 45)(17, 34, 29)(18, 48, 21)(27, 31, 42)(33, 38, 46)

a_5 =(1, 32, 47)(2, 30, 22)(3, 40, 8)(4, 5, 7)(6, 44, 26)(9, 20, 43)(10, 41, 25)(11, 23, 37)(12, 35, 19)(13, 24, 28)(14, 36, 15)(16, 45, 39)(17, 29, 34)(18, 21, 48)(27, 42, 31)(33, 46, 38)

a_6 =(1, 40)(2, 17)(3, 32)(4, 27)(5, 31)(6, 23)(7, 42)(8, 47)(9, 36)(10, 46)(11, 44)(12, 28)(13, 19)(14, 20)(15, 43)(16, 48)(18, 39)(21, 45)(22, 29)(24, 35)(25, 38)(26, 37)(30, 34)(33, 41)

a_7 =(1, 9, 10)(2, 11, 21)(3, 4, 38)(5, 8, 14)(6, 35, 29)(7, 15, 33)(12, 39, 34)(13, 48, 37)(16, 19, 26)(17, 45, 44)(18, 28, 30)(20, 47, 31)(22, 24, 23)(25, 27, 32)(36, 40, 46)(41, 43, 42)

a_8 =(1, 4, 20, 33)(2, 12, 23, 16)(3, 9, 5, 41)(6, 21, 19, 30)(7, 32, 14, 10)(8, 25, 36, 42)(11, 35, 48, 34)(13, 29, 18, 44)(15, 47, 46, 27)(17, 24, 39, 37)(22, 45, 28, 26)(31, 38, 43, 40)

a_9 =(1, 14, 42, 38)(2, 6, 13, 39)(3, 31, 15, 10)(4, 41, 36, 47)(5, 32, 46, 43)(7, 20, 40, 25)(8, 9, 33, 27)(11, 16, 28, 29)(12, 48, 44, 22)(17, 18, 19, 23)(21, 34, 24, 26)(30, 45, 37, 35)

a_{10} =(1, 31, 41)(2, 24, 48)(3, 14, 33)(4, 15, 40)(5, 38, 36)(6, 16, 34)(7, 8, 46)(9, 42, 32)(10, 27, 20)(11, 13, 30)(12, 26, 17)(18, 37, 22)(19, 29, 45)(21, 28, 23)(25, 43, 47)(35, 39, 44)

a_{11} =(1, 25)(2, 18)(3, 46)(4, 8)(5, 15)(6, 17)(7, 38)(9, 47)(10, 43)(11, 22)(12, 29)(13, 23)(14, 40)(16, 44)(19, 39)(20, 42)(21, 37)(24, 30)(26, 35)(27, 41)(28, 48)(31, 32)(33, 36)(34, 45)

a_{12} =(1, 46)(2, 45)(3, 25)(4, 32)(5, 20)(6, 22)(7, 41)(8, 31)(9, 40)(10, 36)(11, 17)(12, 30)(13, 26)(14, 47)(15, 42)(16, 37)(18, 34)(19, 48)(21, 44)(23, 35)(24, 29)(27, 38)(28, 39)(33, 43)

a_{13} =(1, 15, 25, 5)(2, 26, 18, 35)(3, 42, 46, 20)(4, 10, 8, 43)(6, 28, 17, 48)(7, 9, 38, 47)(11, 39, 22, 19)(12, 21, 29, 37)(13, 45, 23, 34)(14, 27, 40, 41)(16, 24, 44, 30)(31, 36, 32, 33)

a_{14} =(1, 10, 9)(2, 21, 11)(3, 38, 4)(5, 14, 8)(6, 29, 35)(7, 33, 15)(12, 34, 39)(13, 37, 48)(16, 26, 19)(17, 44, 45)(18, 30, 28)(20, 31, 47)(22, 23, 24)(25, 32, 27)(36, 46, 40)(41, 42, 43)

a_{15} =(1, 42)(2, 13)(3, 15)(4, 36)(5, 46)(6, 39)(7, 40)(8, 33)(9, 27)(10, 31)(11, 28)(12, 44)(14, 38)(16, 29)(17, 19)(18, 23)(20, 25)(21, 24)(22, 48)(26, 34)(30, 37)(32, 43)(35, 45)(41, 47)

a_{16} =(1, 38, 42, 14)(2, 39, 13, 6)(3, 10, 15, 31)(4, 47, 36, 41)(5, 43, 46, 32)(7, 25, 40, 20)(8, 27, 33, 9)(11, 29, 28, 16)(12, 22, 44, 48)(17, 23, 19, 18)(21, 26, 24, 34)(30, 35, 37, 45)

a_{17} =(1, 43, 27)(2, 37, 28)(3, 7, 36)(4, 46, 14)(5, 40, 33)(6, 12, 45)(8, 15, 38)(9, 25, 31)(10, 47, 42)(11, 18, 24)(13, 21, 22)(16, 35, 17)(19, 44, 34)(20, 32, 41)(23, 30, 48)(26, 39, 29)

a_{18} =(1, 5, 25, 15)(2, 35, 18, 26)(3, 20, 46, 42)(4, 43, 8, 10)(6, 48, 17, 28)(7, 47, 38, 9)(11, 19, 22, 39)(12, 37, 29, 21)(13, 34, 23, 45)(14, 41, 40, 27)(16, 30, 44, 24)(31, 33, 32, 36)

a_{19} =(1, 7)(2, 19)(3, 43)(4, 9)(5, 10)(6, 18)(8, 41)(11, 12)(13, 17)(14, 25)(15, 32)(16, 22)(20, 38)(21, 35)(23, 39)(24, 45)(26, 30)(27, 36)(28, 44)(29, 48)(31, 46)(33, 47)(34, 37)(40, 42)

a_{20} =(1, 20)(2, 23)(3, 5)(4, 33)(6, 19)(7, 14)(8, 36)(9, 41)(10, 32)(11, 48)(12, 16)(13, 18)(15, 46)(17, 39)(21, 30)(22, 28)(24, 37)(25, 42)(26, 45)(27, 47)(29, 44)(31, 43)(34, 35)(38, 40)

a_{21} =(1, 33, 20, 4)(2, 16, 23, 12)(3, 41, 5, 9)(6, 30, 19, 21)(7, 10, 14, 32)(8, 42, 36, 25)(11, 34,

48, 35)(13, 44, 18, 29)(15, 27, 46, 47)(17, 37, 39, 24)(22, 26, 28, 45)(31, 40, 43, 38)

a_{22} =(1, 27, 43)(2, 28, 37)(3, 36, 7)(4, 14, 46)(5, 33, 40)(6, 45, 12)(8, 38, 15)(9, 31, 25)(10, 42, 47)(11, 24, 18)(13, 22, 21)(16, 17, 35)(19, 34, 44)(20, 41, 32)(23, 48, 30)(26, 29, 39)

a_{23} =(1, 41, 31)(2, 48, 24)(3, 33, 14)(4, 40, 15)(5, 36, 38)(6, 34, 16)(7, 46, 8)(9, 32, 42)(10, 20, 27)(11, 30, 13)(12, 17, 26)(18, 22, 37)(19, 45, 29)(21, 23, 28)(25, 47, 43)(35, 44, 39)

a_{24} =(1, 36)(2, 44)(3, 27)(4, 25)(5, 47)(6, 24)(7, 43)(8, 20)(9, 46)(10, 40)(11, 45)(12, 18)(13, 16)(14, 31)(15, 41)(17, 21)(19, 37)(22, 35)(23, 29)(26, 48)(28, 34)(30, 39)(32, 38)(33, 42)

and now the elements themselves: $a_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$

$$a_2 = \begin{pmatrix} 28 & 30 & 0 & 34 & 6 \\ 0 & 26 & 23 & 21 & 23 \\ 15 & 20 & 26 & 29 & 44 \\ 3 & 44 & 23 & 31 & 8 \\ 17 & 29 & 21 & 15 & 31 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} 26 & 15 & 43 & 18 & 5 \\ 45 & 11 & 43 & 1 & 40 \\ 31 & 39 & 11 & 13 & 16 \\ 26 & 16 & 40 & 0 & 10 \\ 9 & 13 & 1 & 36 & 0 \end{pmatrix}$$

$$a_4 = \begin{pmatrix} 8 & 9 & 6 & 45 & 35 \\ 4 & 32 & 25 & 25 & 20 \\ 3 & 4 & 34 & 3 & 30 \\ 30 & 5 & 44 & 27 & 9 \\ 12 & 15 & 20 & 32 & 39 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} 8 & 6 & 8 & 24 & 13 \\ 3 & 34 & 25 & 20 & 44 \\ 28 & 4 & 32 & 15 & 5 \\ 41 & 30 & 20 & 39 & 9 \\ 46 & 3 & 25 & 32 & 27 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 10 & 17 & 18 & 17 & 37 \\ 9 & 30 & 31 & 23 & 1 \\ 32 & 43 & 30 & 23 & 22 \\ 42 & 22 & 1 & 36 & 0 \\ 32 & 23 & 23 & 13 & 36 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 29 & 42 & 23 & 25 & 18 \\ 8 & 17 & 17 & 45 & 12 \\ 37 & 14 & 6 & 7 & 14 \\ 7 & 31 & 40 & 2 & 37 \\ 15 & 16 & 15 & 17 & 39 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} 17 & 16 & 19 & 11 & 6 \\ 0 & 44 & 26 & 25 & 5 \\ 23 & 23 & 29 & 7 & 44 \\ 29 & 29 & 12 & 17 & 13 \\ 4 & 18 & 7 & 37 & 33 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} 34 & 2 & 26 & 8 & 43 \\ 19 & 13 & 5 & 18 & 39 \\ 22 & 5 & 40 & 38 & 29 \\ 21 & 16 & 38 & 34 & 12 \\ 43 & 37 & 41 & 43 & 19 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} 3 & 37 & 19 & 16 & 29 \\ 33 & 42 & 18 & 37 & 20 \\ 15 & 21 & 18 & 22 & 26 \\ 42 & 28 & 45 & 33 & 28 \\ 43 & 23 & 25 & 9 & 44 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 46 & 45 & 32 & 43 & 31 \\ 16 & 28 & 1 & 30 & 25 \\ 46 & 28 & 28 & 44 & 11 \\ 39 & 11 & 25 & 20 & 23 \\ 45 & 44 & 30 & 9 & 20 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} 27 & 12 & 29 & 18 & 29 \\ 38 & 30 & 5 & 22 & 13 \\ 6 & 35 & 30 & 28 & 25 \\ 38 & 25 & 13 & 4 & 16 \\ 9 & 28 & 22 & 2 & 4 \end{pmatrix}$$

$$a_{13} = \begin{pmatrix} 33 & 31 & 0 & 7 & 46 \\ 5 & 13 & 19 & 15 & 32 \\ 18 & 15 & 15 & 40 & 18 \\ 6 & 28 & 29 & 35 & 8 \\ 18 & 26 & 8 & 5 & 44 \end{pmatrix}$$

$$a_{14} = \begin{pmatrix} 29 & 27 & 16 & 30 & 14 \\ 35 & 6 & 17 & 15 & 40 \\ 21 & 14 & 17 & 16 & 31 \\ 9 & 14 & 12 & 39 & 37 \\ 36 & 7 & 45 & 17 & 2 \end{pmatrix}$$

$$a_{15} = \begin{pmatrix} 23 & 16 & 6 & 33 & 11 \\ 3 & 36 & 34 & 45 & 29 \\ 8 & 16 & 36 & 1 & 18 \\ 29 & 18 & 29 & 0 & 22 \\ 40 & 1 & 45 & 6 & 0 \end{pmatrix}$$

$$a_{16} = \begin{pmatrix} 34 & 44 & 38 & 39 & 42 \\ 13 & 40 & 5 & 41 & 38 \\ 1 & 5 & 13 & 37 & 16 \\ 45 & 29 & 39 & 19 & 12 \\ 4 & 38 & 18 & 43 & 34 \end{pmatrix}$$

$$a_{17} = \begin{pmatrix} 25 & 24 & 35 & 9 & 41 \\ 32 & 8 & 28 & 38 & 29 \\ 43 & 16 & 1 & 38 & 14 \\ 5 & 41 & 44 & 4 & 1 \\ 32 & 14 & 37 & 7 & 8 \end{pmatrix}$$

$$a_{18} = \begin{pmatrix} 33 & 36 & 10 & 36 & 12 \\ 0 & 15 & 19 & 8 & 29 \\ 39 & 15 & 13 & 26 & 28 \\ 23 & 18 & 32 & 44 & 8 \\ 27 & 40 & 15 & 5 & 35 \end{pmatrix}$$

$$a_{19} = \begin{pmatrix} 1 & 40 & 13 & 19 & 32 \\ 30 & 20 & 35 & 39 & 12 \\ 20 & 15 & 20 & 4 & 13 \\ 16 & 13 & 12 & 27 & 30 \\ 33 & 4 & 39 & 27 & 27 \end{pmatrix}$$

$$a_{20} = \begin{pmatrix} 35 & 7 & 7 & 1 & 43 \\ 27 & 12 & 24 & 12 & 21 \\ 27 & 34 & 12 & 5 & 17 \\ 45 & 17 & 21 & 18 & 40 \\ 24 & 5 & 12 & 43 & 18 \end{pmatrix}$$

$$a_{21} = \begin{pmatrix} 17 & 46 & 0 & 8 & 11 \\ 33 & 29 & 26 & 7 & 12 \\ 8 & 23 & 44 & 18 & 29 \\ 3 & 44 & 5 & 33 & 13 \\ 29 & 7 & 25 & 37 & 17 \end{pmatrix}$$

$$a_{22} = \begin{pmatrix} 25 & 39 & 17 & 17 & 10 \\ 41 & 1 & 28 & 37 & 44 \\ 12 & 16 & 8 & 14 & 41 \\ 44 & 14 & 29 & 8 & 1 \\ 28 & 38 & 38 & 7 & 4 \end{pmatrix}$$

$$a_{23} = \begin{pmatrix} 3 & 30 & 19 & 39 & 37 \\ 33 & 18 & 18 & 25 & 45 \\ 42 & 21 & 42 & 23 & 28 \\ 38 & 26 & 20 & 44 & 28 \\ 8 & 22 & 37 & 9 & 33 \end{pmatrix}$$

$$a_{24} = \begin{pmatrix} 22 & 40 & 39 & 20 & 13 \\ 43 & 11 & 45 & 15 & 38 \\ 20 & 44 & 11 & 19 & 45 \\ 30 & 45 & 38 & 2 & 11 \\ 10 & 19 & 15 & 19 & 2 \end{pmatrix}$$

Kernel has order 1 and is generated by:

There are 2 orbits on the BLT set.

The orbit length are $[24^2]$

The orbits are:

$O_0 = \{1, 3, 4, 5, 7, 8, 9, 10, 14, 15, 20, 25, 27, 31, 32, 33, 36, 38, 40, 41, 42, 43, 46, 47\}$ (length 24)

$O_1 = \{2, 6, 11, 12, 13, 16, 17, 18, 19, 21, 22, 23, 24, 26, 28, 29, 30, 34, 35, 37, 39, 44, 45, 48\}$ (length 24)

The actions induced on the orbits are:

Induced action on orbit $O_0 = \{1, 3, 4, 5, 7, 8, 9, 10, 14, 15, 20, 25, 27, 31, 32, 33, 36, 38, 40, 41, 42, 43, 46, 47\}$ (length 24)

The induced group has order 24 and is generated by:

g_1 =(1, 2)(3, 14)(4, 21)(5, 13)(6, 15)(7, 9)(8, 16)(10, 11)(12, 23)(17, 22)(18, 20)(19, 24)

g_2 =(1, 6)(2, 24)(3, 21)(4, 13)(5, 14)(7, 10)(8, 18)(9, 22)(11, 17)(12, 16)(15, 19)(20, 23)

g_3 =(1, 7, 8)(2, 3, 18)(4, 6, 9)(5, 10, 16)(11, 24, 14)(12, 13, 15)(17, 19, 23)(20, 22, 21)

group order is small, so we list all elements a_1 =id

a_2 =(1, 2)(3, 14)(4, 21)(5, 13)(6, 15)(7, 9)(8, 16)(10, 11)(12, 23)(17, 22)(18, 20)(19, 24)

a_3 =(1, 6)(2, 24)(3, 21)(4, 13)(5, 14)(7, 10)(8, 18)(9, 22)(11, 17)(12, 16)(15, 19)(20, 23)

a_4 =(1, 24, 15)(2, 6, 19)(3, 5, 4)(7, 22, 11)(8, 12, 20)(9, 10, 17)(13, 14, 21)(16, 18, 23)

a_5 =(1, 15, 24)(2, 19, 6)(3, 4, 5)(7, 11, 22)(8, 20, 12)(9, 17, 10)(13, 21, 14)(16, 23, 18)

a_6 =(1, 19)(2, 15)(3, 13)(4, 14)(5, 21)(6, 24)(7, 17)(8, 23)(9, 11)(10, 22)(12, 18)(16, 20)

a_7 =(1, 7, 8)(2, 3, 18)(4, 6, 9)(5, 10, 16)(11, 24, 14)(12, 13, 15)(17, 19, 23)(20, 22, 21)

a_8 =(1, 3, 11, 16)(2, 7, 4, 20)(5, 15, 9, 8)(6, 12, 17, 21)(10, 24, 23, 13)(14, 18, 22, 19)

a_9 =(1, 9, 21, 18)(2, 14, 10, 8)(3, 20, 17, 24)(4, 15, 23, 22)(5, 11, 19, 12)(6, 7, 16, 13)

a_{10} =(1, 14, 20)(2, 9, 16)(3, 10, 19)(4, 18, 17)(5, 6, 23)(7, 21, 15)(8, 13, 11)(12, 22, 24)

a_{11} =(1, 12)(2, 23)(3, 6)(4, 10)(5, 18)(7, 24)(8, 22)(9, 19)(11, 21)(13, 20)(14, 15)(16, 17)

a_{12} =(1, 23)(2, 12)(3, 15)(4, 11)(5, 20)(6, 14)(7, 19)(8, 17)(9, 24)(10, 21)(13, 18)(16, 22)

a_{13} =(1, 10, 12, 4)(2, 21, 23, 11)(3, 8, 6, 22)(5, 7, 18, 24)(9, 13, 19, 20)(14, 17, 15, 16)

a_{14} =(1, 8, 7)(2, 18, 3)(4, 9, 6)(5, 16, 10)(11, 14, 24)(12, 15, 13)(17, 23, 19)(20, 21, 22)

a_{15} =(1, 21)(2, 10)(3, 17)(4, 23)(5, 19)(6, 16)(7, 13)(8, 14)(9, 18)(11, 12)(15, 22)(20, 24)

a_{16} =(1, 18, 21, 9)(2, 8, 10, 14)(3, 24, 17, 20)(4, 22, 23, 15)(5, 12, 19, 11)(6, 13, 16, 7)

a_{17} =(1, 22, 13)(2, 5, 17)(3, 23, 9)(4, 19, 16)(6, 10, 18)(7, 12, 14)(8, 24, 21)(11, 15, 20)

a_{18} =(1, 4, 12, 10)(2, 11, 23, 21)(3, 22, 6, 8)(5, 24, 18, 7)(9, 20, 19, 13)(14, 16, 15, 17)

a_{19} =(1, 5)(2, 22)(3, 7)(4, 8)(6, 20)(9, 12)(10, 15)(11, 18)(13, 17)(14, 23)(16, 24)(19, 21)

a_{20} =(1, 11)(2, 4)(3, 16)(5, 9)(6, 17)(7, 20)(8, 15)(10, 23)(12, 21)(13, 24)(14, 22)(18, 19)

a_{21} =(1, 16, 11, 3)(2, 20, 4, 7)(5, 8, 9, 15)(6, 21, 17, 12)(10, 13, 23, 24)(14, 19, 22, 18)

a_{22} =(1, 13, 22)(2, 17, 5)(3, 9, 23)(4, 16, 19)(6, 18, 10)(7, 14, 12)(8, 21, 24)(11, 20, 15)

a_{23} =(1, 20, 14)(2, 16, 9)(3, 19, 10)(4, 17, 18)(5, 23, 6)(7, 15, 21)(8, 11, 13)(12, 24, 22)

a_{24} =(1, 17)(2, 13)(3, 12)(4, 24)(5, 22)(6, 11)(7, 23)(8, 19)(9, 14)(10, 20)(15, 18)(16, 21)

and now the elements themselves: $a_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$

$$a_2 = \begin{pmatrix} 28 & 30 & 0 & 34 & 6 \\ 0 & 26 & 23 & 21 & 23 \\ 15 & 20 & 26 & 29 & 44 \\ 3 & 44 & 23 & 31 & 8 \\ 17 & 29 & 21 & 15 & 31 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} 26 & 15 & 43 & 18 & 5 \\ 45 & 11 & 43 & 1 & 40 \\ 31 & 39 & 11 & 13 & 16 \\ 26 & 16 & 40 & 0 & 10 \\ 9 & 13 & 1 & 36 & 0 \end{pmatrix}$$

$$a_4 = \begin{pmatrix} 8 & 9 & 6 & 45 & 35 \\ 4 & 32 & 25 & 25 & 20 \\ 3 & 4 & 34 & 3 & 30 \\ 30 & 5 & 44 & 27 & 9 \\ 12 & 15 & 20 & 32 & 39 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} 8 & 6 & 8 & 24 & 13 \\ 3 & 34 & 25 & 20 & 44 \\ 28 & 4 & 32 & 15 & 5 \\ 41 & 30 & 20 & 39 & 9 \\ 46 & 3 & 25 & 32 & 27 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 10 & 17 & 18 & 17 & 37 \\ 9 & 30 & 31 & 23 & 1 \\ 32 & 43 & 30 & 23 & 22 \\ 42 & 22 & 1 & 36 & 0 \\ 32 & 23 & 23 & 13 & 36 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 29 & 42 & 23 & 25 & 18 \\ 8 & 17 & 17 & 45 & 12 \\ 37 & 14 & 6 & 7 & 14 \\ 7 & 31 & 40 & 2 & 37 \\ 15 & 16 & 15 & 17 & 39 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} 17 & 16 & 19 & 11 & 6 \\ 0 & 44 & 26 & 25 & 5 \\ 23 & 23 & 29 & 7 & 44 \\ 29 & 29 & 12 & 17 & 13 \\ 4 & 18 & 7 & 37 & 33 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} 34 & 2 & 26 & 8 & 43 \\ 19 & 13 & 5 & 18 & 39 \\ 22 & 5 & 40 & 38 & 29 \\ 21 & 16 & 38 & 34 & 12 \\ 43 & 37 & 41 & 43 & 19 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} 3 & 37 & 19 & 16 & 29 \\ 33 & 42 & 18 & 37 & 20 \\ 15 & 21 & 18 & 22 & 26 \\ 42 & 28 & 45 & 33 & 28 \\ 43 & 23 & 25 & 9 & 44 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 46 & 45 & 32 & 43 & 31 \\ 16 & 28 & 1 & 30 & 25 \\ 46 & 28 & 28 & 44 & 11 \\ 39 & 11 & 25 & 20 & 23 \\ 45 & 44 & 30 & 9 & 20 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} 27 & 12 & 29 & 18 & 29 \\ 38 & 30 & 5 & 22 & 13 \\ 6 & 35 & 30 & 28 & 25 \\ 38 & 25 & 13 & 4 & 16 \\ 9 & 28 & 22 & 2 & 4 \end{pmatrix}$$

$$a_{13} = \begin{pmatrix} 33 & 31 & 0 & 7 & 46 \\ 5 & 13 & 19 & 15 & 32 \\ 18 & 15 & 15 & 40 & 18 \\ 6 & 28 & 29 & 35 & 8 \\ 18 & 26 & 8 & 5 & 44 \end{pmatrix}$$

$$a_{14} = \begin{pmatrix} 29 & 27 & 16 & 30 & 14 \\ 35 & 6 & 17 & 15 & 40 \\ 21 & 14 & 17 & 16 & 31 \\ 9 & 14 & 12 & 39 & 37 \\ 36 & 7 & 45 & 17 & 2 \end{pmatrix}$$

$$a_{15} = \begin{pmatrix} 23 & 16 & 6 & 33 & 11 \\ 3 & 36 & 34 & 45 & 29 \\ 8 & 16 & 36 & 1 & 18 \\ 29 & 18 & 29 & 0 & 22 \\ 40 & 1 & 45 & 6 & 0 \end{pmatrix}$$

$$a_{16} = \begin{pmatrix} 34 & 44 & 38 & 39 & 42 \\ 13 & 40 & 5 & 41 & 38 \\ 1 & 5 & 13 & 37 & 16 \\ 45 & 29 & 39 & 19 & 12 \\ 4 & 38 & 18 & 43 & 34 \end{pmatrix}$$

$$a_{17} = \begin{pmatrix} 25 & 24 & 35 & 9 & 41 \\ 32 & 8 & 28 & 38 & 29 \\ 43 & 16 & 1 & 38 & 14 \\ 5 & 41 & 44 & 4 & 1 \\ 32 & 14 & 37 & 7 & 8 \end{pmatrix}$$

$$a_{18} = \begin{pmatrix} 33 & 36 & 10 & 36 & 12 \\ 0 & 15 & 19 & 8 & 29 \\ 39 & 15 & 13 & 26 & 28 \\ 23 & 18 & 32 & 44 & 8 \\ 27 & 40 & 15 & 5 & 35 \end{pmatrix}$$

$$a_{19} = \begin{pmatrix} 1 & 40 & 13 & 19 & 32 \\ 30 & 20 & 35 & 39 & 12 \\ 20 & 15 & 20 & 4 & 13 \\ 16 & 13 & 12 & 27 & 30 \\ 33 & 4 & 39 & 27 & 27 \end{pmatrix}$$

$$a_{20} = \begin{pmatrix} 35 & 7 & 7 & 1 & 43 \\ 27 & 12 & 24 & 12 & 21 \\ 27 & 34 & 12 & 5 & 17 \\ 45 & 17 & 21 & 18 & 40 \\ 24 & 5 & 12 & 43 & 18 \end{pmatrix}$$

$$a_{21} = \begin{pmatrix} 17 & 46 & 0 & 8 & 11 \\ 33 & 29 & 26 & 7 & 12 \\ 8 & 23 & 44 & 18 & 29 \\ 3 & 44 & 5 & 33 & 13 \\ 29 & 7 & 25 & 37 & 17 \end{pmatrix}$$

$$a_{22} = \begin{pmatrix} 25 & 39 & 17 & 17 & 10 \\ 41 & 1 & 28 & 37 & 44 \\ 12 & 16 & 8 & 14 & 41 \\ 44 & 14 & 29 & 8 & 1 \\ 28 & 38 & 38 & 7 & 4 \end{pmatrix}$$

$$a_{23} = \begin{pmatrix} 3 & 30 & 19 & 39 & 37 \\ 33 & 18 & 18 & 25 & 45 \\ 42 & 21 & 42 & 23 & 28 \\ 38 & 26 & 20 & 44 & 28 \\ 8 & 22 & 37 & 9 & 33 \end{pmatrix}$$

$$a_{24} = \begin{pmatrix} 22 & 40 & 39 & 20 & 13 \\ 43 & 11 & 45 & 15 & 38 \\ 20 & 44 & 11 & 19 & 45 \\ 30 & 45 & 38 & 2 & 11 \\ 10 & 19 & 15 & 19 & 2 \end{pmatrix}$$

Kernel has order 1 and is generated by:

Induced action on orbit $O_1 = \{2, 6, 11, 12, 13, 16, 17, 18, 19, 21, 22, 23, 24, 26, 28, 29, 30, 34, 35, 37, 39, 44, 45, 48$

(length 24)

The induced group has order 24 and is generated by:

g_1 =(1, 18)(2, 3)(4, 13)(5, 19)(6, 10)(7, 11)(8, 23)(9, 15)(12, 14)(16, 17)(20, 22)(21, 24)

g_2 =(1, 16)(2, 20)(3, 14)(4, 5)(6, 8)(7, 17)(9, 13)(10, 21)(11, 18)(12, 22)(15, 19)(23, 24)

g_3 =(1, 3, 10)(2, 19, 16)(4, 21, 18)(5, 24, 20)(6, 9, 14)(7, 23, 22)(8, 15, 17)(11, 13, 12)

group order is small, so we list all elements a_1 =id

a_2 =(1, 18)(2, 3)(4, 13)(5, 19)(6, 10)(7, 11)(8, 23)(9, 15)(12, 14)(16, 17)(20, 22)(21, 24)

a_3 =(1, 16)(2, 20)(3, 14)(4, 5)(6, 8)(7, 17)(9, 13)(10, 21)(11, 18)(12, 22)(15, 19)(23, 24)

a_4 =(1, 11, 17)(2, 14, 22)(3, 20, 12)(4, 9, 19)(5, 15, 13)(6, 21, 23)(7, 18, 16)(8, 24, 10)

a_5 =(1, 17, 11)(2, 22, 14)(3, 12, 20)(4, 19, 9)(5, 13, 15)(6, 23, 21)(7, 16, 18)(8, 10, 24)

a_6 =(1, 7)(2, 12)(3, 22)(4, 15)(5, 9)(6, 24)(8, 21)(10, 23)(11, 16)(13, 19)(14, 20)(17, 18)

a_7 =(1, 3, 10)(2, 19, 16)(4, 21, 18)(5, 24, 20)(6, 9, 14)(7, 23, 22)(8, 15, 17)(11, 13, 12)

a_8 =(1, 4, 12, 6)(2, 10, 9, 17)(3, 19, 24, 18)(5, 16, 8, 22)(7, 13, 21, 20)(11, 23, 15, 14)

a_9 =(1, 2, 5, 21)(3, 6, 15, 16)(4, 24, 22, 11)(7, 8, 9, 12)(10, 18, 13, 14)(17, 23, 20, 19)

a_{10} =(1, 13, 24)(2, 6, 18)(3, 5, 17)(4, 14, 7)(8, 20, 11)(9, 16, 23)(10, 15, 12)(19, 21, 22)

a_{11} =(1, 8)(2, 7)(3, 11)(4, 16)(5, 12)(6, 22)(9, 21)(10, 20)(13, 17)(14, 19)(15, 24)(18, 23)

a_{12} =(1, 23)(2, 11)(3, 7)(4, 17)(5, 14)(6, 20)(8, 18)(9, 24)(10, 22)(12, 19)(13, 16)(15, 21)

a_{13} =(1, 14, 8, 19)(2, 15, 7, 24)(3, 21, 11, 9)(4, 10, 16, 20)(5, 23, 12, 18)(6, 13, 22, 17)

a_{14} =(1, 10, 3)(2, 16, 19)(4, 18, 21)(5, 20, 24)(6, 14, 9)(7, 22, 23)(8, 17, 15)(11, 12, 13)

a_{15} =(1, 5)(2, 21)(3, 15)(4, 22)(6, 16)(7, 9)(8, 12)(10, 13)(11, 24)(14, 18)(17, 20)(19, 23)

a_{16} =(1, 21, 5, 2)(3, 16, 15, 6)(4, 11, 22, 24)(7, 12, 9, 8)(10, 14, 13, 18)(17, 19, 20, 23)

a_{17} =(1, 20, 15)(2, 4, 23)(3, 8, 13)(5, 10, 11)(6, 19, 7)(9, 22, 18)(12, 17, 24)(14, 21, 16)

a_{18} =(1, 19, 8, 14)(2, 24, 7, 15)(3, 9, 11, 21)(4, 20, 16, 10)(5, 18, 12, 23)(6, 17, 22, 13)

a_{19} =(1, 9)(2, 8)(3, 4)(5, 7)(6, 11)(10, 19)(12, 21)(13, 23)(14, 17)(15, 22)(16, 24)(18, 20)

a_{20} =(1, 12)(2, 9)(3, 24)(4, 6)(5, 8)(7, 21)(10, 17)(11, 15)(13, 20)(14, 23)(16, 22)(18, 19)

a_{21} =(1, 6, 12, 4)(2, 17, 9, 10)(3, 18, 24, 19)(5, 22, 8, 16)(7, 20, 21, 13)(11, 14, 15, 23)

a_{22} =(1, 15, 20)(2, 23, 4)(3, 13, 8)(5, 11, 10)(6, 7, 19)(9, 18, 22)(12, 24, 17)(14, 16, 21)

a_{23} =(1, 24, 13)(2, 18, 6)(3, 17, 5)(4, 7, 14)(8, 11, 20)(9, 23, 16)(10, 12, 15)(19, 22, 21)

a_{24} =(1, 22)(2, 13)(3, 23)(4, 8)(5, 6)(7, 10)(9, 20)(11, 19)(12, 16)(14, 24)(15, 18)(17, 21)

and now the elements themselves: $a_1 = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$

$$a_2 = \begin{pmatrix} 28 & 30 & 0 & 34 & 6 \\ 0 & 26 & 23 & 21 & 23 \\ 15 & 20 & 26 & 29 & 44 \\ 3 & 44 & 23 & 31 & 8 \\ 17 & 29 & 21 & 15 & 31 \end{pmatrix}$$

$$a_3 = \begin{pmatrix} 26 & 15 & 43 & 18 & 5 \\ 45 & 11 & 43 & 1 & 40 \\ 31 & 39 & 11 & 13 & 16 \\ 26 & 16 & 40 & 0 & 10 \\ 9 & 13 & 1 & 36 & 0 \end{pmatrix}$$

$$a_4 = \begin{pmatrix} 8 & 9 & 6 & 45 & 35 \\ 4 & 32 & 25 & 25 & 20 \\ 3 & 4 & 34 & 3 & 30 \\ 30 & 5 & 44 & 27 & 9 \\ 12 & 15 & 20 & 32 & 39 \end{pmatrix}$$

$$a_5 = \begin{pmatrix} 8 & 6 & 8 & 24 & 13 \\ 3 & 34 & 25 & 20 & 44 \\ 28 & 4 & 32 & 15 & 5 \\ 41 & 30 & 20 & 39 & 9 \\ 46 & 3 & 25 & 32 & 27 \end{pmatrix}$$

$$a_6 = \begin{pmatrix} 10 & 17 & 18 & 17 & 37 \\ 9 & 30 & 31 & 23 & 1 \\ 32 & 43 & 30 & 23 & 22 \\ 42 & 22 & 1 & 36 & 0 \\ 32 & 23 & 23 & 13 & 36 \end{pmatrix}$$

$$a_7 = \begin{pmatrix} 29 & 42 & 23 & 25 & 18 \\ 8 & 17 & 17 & 45 & 12 \\ 37 & 14 & 6 & 7 & 14 \\ 7 & 31 & 40 & 2 & 37 \\ 15 & 16 & 15 & 17 & 39 \end{pmatrix}$$

$$a_8 = \begin{pmatrix} 17 & 16 & 19 & 11 & 6 \\ 0 & 44 & 26 & 25 & 5 \\ 23 & 23 & 29 & 7 & 44 \\ 29 & 29 & 12 & 17 & 13 \\ 4 & 18 & 7 & 37 & 33 \end{pmatrix}$$

$$a_9 = \begin{pmatrix} 34 & 2 & 26 & 8 & 43 \\ 19 & 13 & 5 & 18 & 39 \\ 22 & 5 & 40 & 38 & 29 \\ 21 & 16 & 38 & 34 & 12 \\ 43 & 37 & 41 & 43 & 19 \end{pmatrix}$$

$$a_{10} = \begin{pmatrix} 3 & 37 & 19 & 16 & 29 \\ 33 & 42 & 18 & 37 & 20 \\ 15 & 21 & 18 & 22 & 26 \\ 42 & 28 & 45 & 33 & 28 \\ 43 & 23 & 25 & 9 & 44 \end{pmatrix}$$

$$a_{11} = \begin{pmatrix} 46 & 45 & 32 & 43 & 31 \\ 16 & 28 & 1 & 30 & 25 \\ 46 & 28 & 28 & 44 & 11 \\ 39 & 11 & 25 & 20 & 23 \\ 45 & 44 & 30 & 9 & 20 \end{pmatrix}$$

$$a_{12} = \begin{pmatrix} 27 & 12 & 29 & 18 & 29 \\ 38 & 30 & 5 & 22 & 13 \\ 6 & 35 & 30 & 28 & 25 \\ 38 & 25 & 13 & 4 & 16 \\ 9 & 28 & 22 & 2 & 4 \end{pmatrix}$$

$$a_{13} = \begin{pmatrix} 33 & 31 & 0 & 7 & 46 \\ 5 & 13 & 19 & 15 & 32 \\ 18 & 15 & 15 & 40 & 18 \\ 6 & 28 & 29 & 35 & 8 \\ 18 & 26 & 8 & 5 & 44 \end{pmatrix}$$

$$a_{14} = \begin{pmatrix} 29 & 27 & 16 & 30 & 14 \\ 35 & 6 & 17 & 15 & 40 \\ 21 & 14 & 17 & 16 & 31 \\ 9 & 14 & 12 & 39 & 37 \\ 36 & 7 & 45 & 17 & 2 \end{pmatrix}$$

$$a_{15} = \begin{pmatrix} 23 & 16 & 6 & 33 & 11 \\ 3 & 36 & 34 & 45 & 29 \\ 8 & 16 & 36 & 1 & 18 \\ 29 & 18 & 29 & 0 & 22 \\ 40 & 1 & 45 & 6 & 0 \end{pmatrix}$$

$$a_{16} = \begin{pmatrix} 34 & 44 & 38 & 39 & 42 \\ 13 & 40 & 5 & 41 & 38 \\ 1 & 5 & 13 & 37 & 16 \\ 45 & 29 & 39 & 19 & 12 \\ 4 & 38 & 18 & 43 & 34 \end{pmatrix}$$

$$a_{17} = \begin{pmatrix} 25 & 24 & 35 & 9 & 41 \\ 32 & 8 & 28 & 38 & 29 \\ 43 & 16 & 1 & 38 & 14 \\ 5 & 41 & 44 & 4 & 1 \\ 32 & 14 & 37 & 7 & 8 \end{pmatrix}$$

$$a_{18} = \begin{pmatrix} 33 & 36 & 10 & 36 & 12 \\ 0 & 15 & 19 & 8 & 29 \\ 39 & 15 & 13 & 26 & 28 \\ 23 & 18 & 32 & 44 & 8 \\ 27 & 40 & 15 & 5 & 35 \end{pmatrix}$$

$$a_{19} = \begin{pmatrix} 1 & 40 & 13 & 19 & 32 \\ 30 & 20 & 35 & 39 & 12 \\ 20 & 15 & 20 & 4 & 13 \\ 16 & 13 & 12 & 27 & 30 \\ 33 & 4 & 39 & 27 & 27 \end{pmatrix}$$

$$a_{20} = \begin{pmatrix} 35 & 7 & 7 & 1 & 43 \\ 27 & 12 & 24 & 12 & 21 \\ 27 & 34 & 12 & 5 & 17 \\ 45 & 17 & 21 & 18 & 40 \\ 24 & 5 & 12 & 43 & 18 \end{pmatrix}$$

$$a_{21} = \begin{pmatrix} 17 & 46 & 0 & 8 & 11 \\ 33 & 29 & 26 & 7 & 12 \\ 8 & 23 & 44 & 18 & 29 \\ 3 & 44 & 5 & 33 & 13 \\ 29 & 7 & 25 & 37 & 17 \end{pmatrix}$$

$$a_{22} = \begin{pmatrix} 25 & 39 & 17 & 17 & 10 \\ 41 & 1 & 28 & 37 & 44 \\ 12 & 16 & 8 & 14 & 41 \\ 44 & 14 & 29 & 8 & 1 \\ 28 & 38 & 38 & 7 & 4 \end{pmatrix}$$

$$a_{23} = \begin{pmatrix} 3 & 30 & 19 & 39 & 37 \\ 33 & 18 & 18 & 25 & 45 \\ 42 & 21 & 42 & 23 & 28 \\ 38 & 26 & 20 & 44 & 28 \\ 8 & 22 & 37 & 9 & 33 \end{pmatrix}$$

$$a_{24} = \begin{pmatrix} 22 & 40 & 39 & 20 & 13 \\ 43 & 11 & 45 & 15 & 38 \\ 20 & 44 & 11 & 19 & 45 \\ 30 & 45 & 38 & 2 & 11 \\ 10 & 19 & 15 & 19 & 2 \end{pmatrix}$$

Kernel has order 1 and is generated by: